

## PATENT ABSTRACTS OF JAPAN

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(71)Applicant : DAISHINKU:KK

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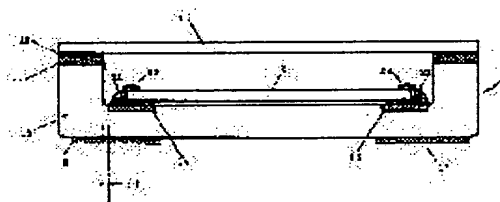
(72)Inventor : IIZUKA MINORU

## (54) PACKAGE FOR ELECTRONIC DEVICE

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a package for electronic device employing a highly reliable lamination technology in which airtightness is not deteriorated, even if the size is reduced.

**SOLUTION:** This package for electronic device comprises a ceramic package 1 having a recessed containing part opening upward, an electronic element, i.e., a quartz diaphragm 3, contained in the package, and a metallic cover 2 bonded to the opening of the package. Electrode pads 14, 15 are formed at a part on the bottom face of the containing part in the ceramic package. The electrode pads 14, 15 are arranged, such that the upper surface thereof is flush with the bottom face of the containing part and connected electrically with lead-out electrodes 16, 17 formed on the bottom face on the outside of the package.



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## CLAIMS

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### [Claim(s)]

[Claim 1] While coming to carry out laminating formation of the ceramic material and having the stowage of a concave electronic-parts element In the package for electronic parts in which it comes to form in the base of the aforementioned stowage two or more electrode pads by which electrical installation is carried out to the aforementioned electronic-parts element The upper surface of the aforementioned electrode pad is a package for electronic parts characterized by being formed so that it may be caudad located from the same flat surface as the base of the aforementioned stowage, or the aforementioned base, and carrying out electric junction of the aforementioned electrode pad and the aforementioned electronic-parts element by conductive jointing material.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention is applied to the package for electronic parts which needs especially a hermetic seal about the package for electronic parts.

[0002]

[Description of the Prior Art] As an example of the electronic parts which need a hermetic seal, crystal application products, such as a quartz resonator, a crystal filter, and a crystal oscillator, are raised. In order that each of these may form a metal thin film electrode in the front face of a crystal diaphragm and may protect this metal thin film electrode from the open air, the hermetic seal of them is carried out.

[0003] The hermetic-seal method has a soldered joint, low-melting-glass junction, resistance welding, electron beam welding, etc. The quartz resonator using resistance welding using HC-49 / U type base as the hermetic-seal method is used widely. This is the base implanted after the lead terminal had insulated mutually through insulating glass to metal shell, and composition which carries out the hermetic seal of the metal cap by resistance welding, and is widely used as the electronic-parts hermetic-seal method of having lead terminals, such as a quartz resonator.

[0004] Moreover, as shown in JP.8-162555,A, the junction method corresponding to surface-mount-izing which carries out a hermetic seal with the seam welding which is one sort of resistance welding of the metal frame (seal ring) formed in a part for opening of the ceramic package in which the drawer electrode was formed, and a metal lid is also adopted.

[0005] Furthermore, in such a package for surface mounts, as shown in JP.8-46075,A, the way electron beam welding or laser-beam welding performs a hermetic seal is also adopted.

[0006] An example of the conventional package for electronic parts is shown in drawing 6 . The concave ceramic package 8 in which the upper part carried out opening consists of the ceramic base 80, the metallized layer 81 which consists of a tungsten formed in opening of the circumference of a concave, a lower deposit 82 which consists of nickel formed in the upper part of a metallized layer, and an up deposit 83 (not shown) which consists of gold formed in the upper part of a lower deposit. The electrode pads 84 and 85 are formed in the internal base of a ceramic package, and these electrode pad is electrically pulled out by the base of the package exterior as drawer electrodes 86 and 87. Between the aforementioned electrode pad 84 and 85, electrical installation of the electronic-parts elements 88, such as a crystal diaphragm, is carried and carried out. A cross section is a concave, conductive jointing material collects and the electrode pads 84 and 85 form the portion.

[0007] Moreover, the metal free wheel plate 89 which carries out a hermetic seal forms metal layers (not shown) such as silver, in the inferior surface of tongue of metal base materials, such as covar. This metal layer is formed using the technique of rolling, and, generally is called the clad plate. When performing a hermetic seal, the metal free wheel plate 89 and the up deposit 83 of the aforementioned ceramic package 8 are piled up, from the upper part of the metal free wheel plate 89, an electron beam is irradiated in the shape of a periphery, and the fused junction of the metal free wheel plate 89 and the deposit (a lower deposit and up deposit) is carried out to the portion corresponding to the aforementioned up deposit 83. Since such a welding process did not need a seal ring for the package side like seam welding, it had the advantage of lowering curtailment of a manufacture man day, and the cost of a package.

[0008] The above-mentioned ceramic package performs a laminating in order as shown in drawing 8 . As shown in drawing 8 (a), the green sheet formed of the doctor blade method etc. is cut in a predetermined size, and the base green sheet 90 is obtained. Next, as shown in drawing 8 (b), the metallized layers 91 and 92 for electrode pads are formed with screen printing etc. In addition, the beer hall for electrode drawers etc. is formed if needed And as shown in drawing 8 (c), the frame-like green sheet 93 is formed near the circumference of the base green sheet 90, and as further shown in drawing 8 (d), the metallized layer 94 for hermetic seals is formed in the upper surface of the frame-like green sheet 93 with screen printing etc. Then, baking fabrication of the object is really [ these ] carried out, and a ceramic package is obtained.

[0009]

[Problem(s) to be Solved by the Invention] With the miniaturization of electronic parts, a package is also



miniaturized and a detailed size design is needed. However, it is difficult to control the laminating precision of ceramics minutely, and the design which permits variation is needed. For example, as shown in drawing 6, it is necessary to set the interval  $t_2$  of the electrode pad 84 and wall 80a of a package base as 12 micrometers or more. In composition like the conventional example, when the interval  $t_2$  concerned was made small aiming at the miniaturization of a package, as shown in drawing 7, the wall portion of a package base lapped with the electrode pad, and the laminating might be carried out by the variation. In addition, drawing 7 -- a part of drawing 6 -- it is an enlarged view. In such a case, junction on the metal free wheel plate with which the metallized layer 81 will not incline was made to produce fault, and sufficient airtightness was no longer acquired and it had the trouble which becomes the structure where the reliability in a sealing surface is missing. As especially shown in this conventional example, in the composition whose electrode pad is a cross-section concave, the metallized layer might incline more by concave \*\*\*\*\*.

[0010] Even if it was made in order that this invention might solve the above-mentioned trouble, and it miniaturizes, airtightness is not reduced and it aims at offering the package for electronic parts using reliable laminating technology.

[0011]

[Means for Solving the Problem] As this invention is shown in a claim 1, while carrying out laminating formation of the ceramic material, becoming and having the stowage of a concave electronic-parts element in the package for electronic parts in which it comes to form in the base of the aforementioned stowage two or more electrode pads by which electrical installation is carried out to the aforementioned electronic-parts element. The upper surface of the aforementioned electrode pad is formed so that it may be caudad located from the same flat surface as the base of the aforementioned stowage, or the aforementioned base, and it is characterized by carrying out electric junction of the aforementioned electrode pad and the aforementioned electronic-parts element by conductive jointing material.

[0012] Since the upper surface of the aforementioned electrode pad is formed so that it may be caudad located from the same flat surface as the base of the aforementioned stowage, or the aforementioned base, even if the laminating position of ceramics shifts and there is a heavy bird clapper in part with an electrode pad portion, a metallized layer does not incline greatly. In addition, in the composition formed so that an electrode pad might be caudad located from a stowage base, since the inclination of a metallized layer becomes large when the position of the upper surface of an electrode pad was too deep and a laminating position shifts, cautions are required.

[0013] Moreover, since the upper surface of the aforementioned electrode pad serves as the composition that the crevice was formed in the composition located caudad from the base of the aforementioned stowage, the conductive jointing material supplied to the electrode pad concerned stops being able to flow out easily. Therefore, even if it is the composition that an electrode pad which was explained with the gestalt of other below-mentioned operations approaches mutually, short circuit accident can be prevented. In the composition in which such a crevice was formed, since a certain amount of depth is needed in order to secure the reservoir function of conductive jointing material, the depth between the upper surfaces of the base of the aforementioned stowage to the aforementioned electrode pad is  $15 \times 10$  micrometers preferably.

[0014]

[Embodiments of the Invention] The gestalt of operation of this invention is explained with drawing 1 and drawing 2 taking the case of a surface mount type quartz resonator. The package for electronic parts consists of the ceramic package 1 which has the concave stowage as for which the upper part carried out opening, a crystal diaphragm 3 which is the electronic-parts element contained in the package concerned, and a metal free wheel plate 2 joined to opening of a package.

[0015] The ceramic package 1 which has a concave stowage consists of the ceramic base 10, the metallized layer 11 which consists of a tungsten formed in opening of the circumference of a concave, a lower deposit 12 which consists of nickel formed in the upper part of a metallized layer, and an up deposit (not shown) which consists of gold formed in the upper part of a lower deposit. A deposit is a field which mainly contributes to welding. Press working of sheet metal of the metallized layer is carried out by punch from the metallized-layer upper part before baking. Thereby, the whole metallized layer is laid under the ceramic base in part, and its bonding strength of both improves while flattening of the upper surface of the metallized layer after baking is carried out.

[0016] For a metallized layer 11, with the gestalt of this operation, 18-20 micrometers and the lower plating 12 are [ 6 micrometers and the up deposit 13 of the thickness of each class ] 1 micrometer. In addition, although there should just be about 15-35 micrometers of thickness of a metallized layer, since the flatness of the upper surface concerned improves when press processing is performed, you may be the thickness not more than it. In addition, by carrying out flattening of the metallized layer, the upper surface maintains a flat state also for each deposit formed in the upper part, and it is formed.

[0017] Moreover, the electrode pads 14 and 15 are formed in a part of stowage base of a ceramic package, and these electrode pads 14 and 15 are electrically connected with the drawer electrodes 16 and 17 formed in the base of the package exterior while they are arranged so that the upper surface may turn into the same flat surface as the aforementioned base. Between the aforementioned electrode pad 14 and 15, the crystal diaphragm which is the electronic-parts element 3 is installed. In addition, these electrode pads 14 and 15 have



set the distance t1 with the wall of a stowage as about 5 micrometers.

[0018] Moreover, the metal free wheel plate 2 which carries out a hermetic seal forms the metal layer (not shown) which consists of silver etc. in the inferior surface of tongue of the metal base materials 20, such as covar. Formation of this metal layer is formed using the technique of rolling. When performing a hermetic seal, by piling up the metal free wheel plate 2 and the deposit (a lower deposit and up deposit) of the aforementioned ceramic package 1, by irradiating an electron beam in the shape of a periphery at the portion corresponding to the aforementioned up deposit 13 from the upper part of the metal free wheel plate 2, a deposit (lower plating and up deposit) fuses and it is joined to the metal free wheel plate 2.

[0019] Other examples of this invention are explained with drawing 3 and drawing 4 taking the case of a surface mount type quartz resonator. Since basic composition is the same as the above-mentioned example, a part for the same structured division omits explanation in part while explaining it using a jack per line.

[0020] The gestalt of this operation is composition which carries out support-at-one-end \*\*\*\*\* of the end of the longitudinal direction of the crystal diaphragm 3 which is an electronic-parts element, and the parallel arrangement of the electrode pads 18 and 19 is carried out to the end of the aforementioned longitudinal direction. The upper surface is the composition of being caudad located rather than the base of a package, and the electrode pads 18 and 19 are the composition which the crevice was formed in the aforementioned base and the electrode pad upper surface exposed by this. In order to support the crystal diaphragm 3, after making the electrode pads 18 and 19 supply and harden the conductive jointing material S1 and S1, construction arrangement of the shorter side of the crystal diaphragm 3 is carried out at a two-electrodes pad. The conductive jointing material S2 and S2 is applied after that, and a crystal diaphragm and an electrode pad are connected electrically. In addition, by contraction at the time of hardening of conductive jointing material, the other end of the longitudinal direction of a crystal diaphragm lost touch with the aforementioned pars basilaris ossis occipitalis, and has eliminated the bad influence to excitation.

[0021] Another example of other of this invention is explained with drawing 5 taking the case of a surface mount type quartz resonator. Since basic composition is the same as an example besides the above, a part for the same structured division omits explanation in part while explaining it using a jack per line.

[0022] The gestalt of this operation is composition which carries out support-at-one-end \*\*\*\*\* of the end of the longitudinal direction of the crystal diaphragm 3 which is an electronic-parts element, and the parallel arrangement of the electrode pads 41 and 41 is carried out to the end of the aforementioned longitudinal direction. A cross section is a concave, and the electrode pads 41 and 41 are formed so that concave \*\*\*\*\* and the base of a package may be located in the same flat surface. In order to support the crystal diaphragm 3, after making the electrode pads 41 and 41 supply and harden the conductive jointing material S1 and S1, construction arrangement of the shorter side of the crystal diaphragm 3 is carried out at a two-electrodes pad. The conductive jointing material S2 and S2 is applied after that, and a crystal diaphragm and an electrode pad are connected electrically. In addition, by contraction at the time of hardening of conductive jointing material, the other end of the longitudinal direction of a crystal diaphragm lost touch with the aforementioned pars basilaris ossis occipitalis, and has eliminated the bad influence to excitation.

[0023] In addition, the hermetic-seal method should just use the well-known junction methods, such as electron beam welding, laser-beam welding, or seam welding. In addition, when using seam welding, it is necessary to attach a metal ring in the metallized-layer upper part for opening of a package, and to prepare for welding.

[0024]

[Effect of the Invention] Since according to this invention the upper surface of the aforementioned electrode pad is formed so that it may be caudad located from the same flat surface as the base of the aforementioned stowage or the aforementioned base, even if the laminating position of ceramics shifts and there is a heavy bird clapper in part with an electrode pad portion, a metallized layer does not incline greatly. Therefore, airtight junction on a metal free wheel plate can be good, and can raise the manufacture yield in a sealing surface.

[0025] Moreover, since it is the composition of permitting the manufacture error of the laminating of a ceramic, the miniaturization of a package is realizable as a whole.

[0026] Moreover, since the upper surface of the aforementioned electrode pad serves as the composition that the crevice was formed in the composition located caudad from the base of the aforementioned stowage, the conductive jointing material supplied to the electrode pad concerned stops being able to flow out easily. Therefore, even if it is the composition that an electrode pad which was explained with the gestalt of other below-mentioned operations approaches mutually, short circuit accident can be prevented.

## TECHNICAL FIELD

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[The technical field to which invention belongs] this invention is applied to the package for electronic parts which needs especially a hermetic seal about the package for electronic parts.

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## PRIOR ART

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[Description of the Prior Art] As an example of the electronic parts which need a hermetic seal, crystal application products, such as a quartz resonator, a crystal filter, and a crystal oscillator, are raised. In order that each of these may form a metal thin film electrode in the front face of a crystal diaphragm and may protect this metal thin film electrode from the open air, the hermetic seal of them is carried out.

[0003] The hermetic-seal method has a soldered joint, low-melting-glass junction, resistance welding, electron beam welding, etc. The quartz resonator using resistance welding using HC-49 / U type base as the hermetic-seal method is used widely. This is the base implanted after the lead terminal had insulated mutually through insulating glass to metal shell, and composition which carries out the hermetic seal of the metal cap by resistance welding, and is widely used as the electronic-parts hermetic-seal method of having lead terminals, such as a quartz resonator.

[0004] Moreover, as shown in JP.8-162555.A, the junction method corresponding to surface-mounting which carries out a hermetic seal with the seam welding which is one sort of resistance welding of the metal frame (seal ring) formed in a part for opening of the ceramic package in which the drawer electrode was formed, and a metal lid is also adopted.

[0005] Furthermore, in such a package for surface mounts, as shown in JP.8-46075.A, the way electron beam welding or laser-beam welding performs a hermetic seal is also adopted.

[0006] An example of the conventional package for electronic parts is shown in drawing 6. The concave ceramic package 8 in which the upper part carried out opening consists of the ceramic base 80, the metallized layer 81 which consists of a tungsten formed in opening of the circumference of a concave, a lower deposit 82 which consists of nickel formed in the upper part of a metallized layer, and an up deposit 83 (not shown) which consists of gold formed in the upper part of a lower deposit. The electrode pads 84 and 85 are formed in the internal base of a ceramic package, and these electrode pad is electrically pulled out by the base of the package exterior as drawer electrodes 86 and 87. Between the aforementioned electrode pad 84 and 85, electrical installation of the electronic-parts elements 88, such as a crystal diaphragm, is carried and carried out. A cross section is a concave, conductive jointing material collects and the electrode pads 84 and 85 form the portion.

[0007] Moreover, the metal free wheel plate 89 which carries out a hermetic seal forms metal layers (not shown) such as silver, in the inferior surface of tongue of metal base materials, such as covar. This metal layer is formed using the technique of rolling, and, generally is called the clad plate. When performing a hermetic seal, the metal free wheel plate 89 and the up deposit 83 of the aforementioned ceramic package 8 are piled up, from the upper part of the metal free wheel plate 89, an electron beam is irradiated in the shape of a periphery, and the fused junction of the metal free wheel plate 89 and the deposit (a lower deposit and up deposit) is carried out to the portion corresponding to the aforementioned up deposit 83. Since such a welding process did not need a seal ring for the package side like seam welding, it had the advantage of lowering curtailment of a manufacture man day, and the cost of a package.

[0008] The above-mentioned ceramic package performs a laminating in order as shown in drawing 8. As shown in drawing 8 (a), the green sheet formed of the doctor blade method etc. is cut in a predetermined size, and the base green sheet 90 is obtained. Next, as shown in drawing 8 (b), the metallized layers 91 and 92 for electrode pads are formed with screen printing etc. In addition, the beer hall for electrode drawers etc. is formed if needed. And as shown in drawing 8 (c), the frame-like green sheet 93 is formed near the circumference of the base green sheet 90, and as further shown in drawing 8 (d), the metallized layer 94 for hermetic seals is formed in the upper surface of the frame-like green sheet 93 with screen printing etc. Then, baking fabrication of the object is really [ these ] carried out, and a ceramic package is obtained.

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## EFFECT OF THE INVENTION

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[Effect of the Invention] Since according to this invention the upper surface of the aforementioned electrode pad is formed so that it may be located more below than the same flat surface as the base of the aforementioned stowage, or the aforementioned base, even if the laminating position of ceramics shifts and there is a heavy bird clapper in part with an electrode pad portion, a metallized layer does not incline greatly. Therefore, airtight junction on a metal free wheel plate can be good, and can raise the manufacture yield in a sealing surface.

[0025] Moreover, since it is the composition of permitting the manufacture error of the laminating of a ceramic, the miniaturization of a package is realizable as a whole.

[0026] Moreover, since the upper surface of the aforementioned electrode pad serves as the composition that the crevice was formed in the composition located below from the base of the aforementioned stowage, the conductive jointing material supplied to the electrode pad concerned stops being able to flow out easily. Therefore, even if it is the composition that an electrode pad which was explained with the form of other below-mentioned operations approaches mutually, short circuit accident can be prevented.

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## TECHNICAL PROBLEM



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[Problem(s) to be Solved by the Invention] With the miniaturization of electronic parts, a package is also miniaturized and a detailed size design is needed. However, it is difficult to control the laminating precision of ceramics minutely, and the design which permits variation is needed. For example, as shown in drawing 6, it is necessary to set the interval t2 of the electrode pad 84 and wall 80a of a package base as 12 micrometers or more. In composition like the conventional example, when the interval t2 concerned was made small aiming at the miniaturization of a package, as shown in drawing 7, the wall portion of a package base lapped with the electrode pad, and the laminating might be carried out by the variation. in addition, drawing 7 -- a part of drawing 6 -- it is an enlarged view In such a case, junction on the metal free wheel plate with which the metallized layer 81 will not incline was made to produce fault, and sufficient airtightness was no longer acquired and it had the trouble which becomes the structure where the reliability in a sealing surface is missing As especially shown in this conventional example, in the composition whose electrode pad is a cross-section concave, the metallized layer might incline more by concave \*\*\*\*\*.

[0010] Even if it was made in order that this invention might solve the above-mentioned trouble, and it miniaturizes, airtightness is not reduced and it aims at offering the package for electronic parts using reliable laminating technology.

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## MEANS

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[Means for Solving the Problem] As this invention is shown in a claim 1, while carrying out laminating formation of the ceramic material, becoming and having the stowage of a concave electronic-parts element In the package for electronic parts in which it comes to form in the base of the aforementioned stowage two or more electrode pads by which electrical installation is carried out to the aforementioned electronic-parts element The upper surface of the aforementioned electrode pad is formed so that it may be caudad located from the same flat surface as the base of the aforementioned stowage, or the aforementioned base, and it is characterized by carrying out electric junction of the aforementioned electrode pad and the aforementioned electronic-parts element by conductive jointing material.

[0012] Since the upper surface of the aforementioned electrode pad is formed so that it may be caudad located from the same flat surface as the base of the aforementioned stowage, or the aforementioned base, even if the laminating position of ceramics shifts and there is a heavy bird clapper in part with an electrode pad portion, a metallized layer does not incline greatly. In addition, in the composition formed so that an electrode pad might be caudad located from a stowage base, since the inclination of a metallized layer becomes large when the position of the upper surface of an electrode pad was too deep and a laminating position shifts, cautions are required.

[0013] Moreover, since the upper surface of the aforementioned electrode pad serves as the composition that the crevice was formed in the composition located caudad from the base of the aforementioned stowage, the conductive jointing material supplied to the electrode pad concerned stops being able to flow out easily. Therefore, even if it is the composition that an electrode pad which was explained with the gestalt of other below-mentioned operations approaches mutually, short circuit accident can be prevented. In the composition in which such a crevice was formed, since a certain amount of depth is needed in order to secure the reservoir function of conductive jointing material, the depth between the upper surfaces of the base of the aforementioned stowage to the aforementioned electrode pad is 15\*\*10 micrometers preferably.

[0014]

[Embodiments of the Invention] The gestalt of operation of this invention is explained with drawing 1 and drawing 2 taking the case of a surface mount type quartz resonator. The package for electronic parts consists of the ceramic package 1 which has the concave stowage as for which the upper part carried out opening, a crystal diaphragm 3 which is the electronic-parts element contained in the package concerned, and a metal free wheel plate 2 joined to opening of a package.

[0015] The ceramic package 1 which has a concave stowage consists of the ceramic base 10, the metallized layer 11 which consists of a tungsten formed in opening of the circumference of a concave, a lower deposit 12 which consists of nickel formed in the upper part of a metallized layer, and an up deposit (not shown) which consists of gold formed in the upper part of a lower deposit. A deposit is a field which mainly contributes to welding. Press working of sheet metal of the metallized layer is carried out by punch from the metallized-layer upper part before baking. Thereby, the whole metallized layer is laid under the ceramic base in part, and its bonding strength of both improves while flattening of the upper surface of the metallized layer after baking is carried out.

[0016] For a metallized layer 11, with the gestalt of this operation, 18-20 micrometers and the lower plating 12 are [ 6 micrometers and the up deposit 13 of the thickness of each class ] 1 micrometer. In addition, although there should just be about 15-35 micrometers of thickness of a metallized layer, since the flatness of the upper surface concerned improves when press processing is performed, you may be the thickness not more than it. In addition, by carrying out flattening of the metallized layer, the upper surface maintains a flat state-also for each



deposit formed in the upper part, and it is formed.

[0017] Moreover, the electrode pads 14 and 15 are formed in a part of stowage base of a ceramic package, and these electrode pads 14 and 15 are electrically connected with the drawer electrodes 16 and 17 formed in the base of the package exterior while they are arranged so that the upper surface may turn into the same flat surface as the aforementioned base. Between the aforementioned electrode pad 14 and 15, the crystal diaphragm which is the electronic-parts element 3 is installed. In addition, these electrode pads 14 and 15 have set the distance t1 with the wall of a stowage as about 5 micrometers.

[0018] Moreover, the metal free wheel plate 2 which carries out a hermetic seal forms the metal layer (not shown) which consists of silver etc. in the inferior surface of tongue of the metal base materials 20, such as covar. Formation of this metal layer is formed using the technique of rolling. When performing a hermetic seal, by piling up the metal free wheel plate 2 and the deposit (a lower deposit and up deposit) of the aforementioned ceramic package 1, by irradiating an electron beam in the shape of a periphery at the portion corresponding to the aforementioned up deposit 13 from the upper part of the metal free wheel plate 2, a deposit (lower plating and up deposit) fuses and it is joined to the metal free wheel plate 2.

[0019] Other examples of this invention are explained with drawing 3 and drawing 4 taking the case of a surface mount type quartz resonator. Since basic composition is the same as the above-mentioned example, a part for the same structured division omits explanation in part while explaining it using a jack per line.

[0020] The gestalt of this operation is composition which carries out support-at-one-end \*\*\*\*\* of the end of the longitudinal direction of the crystal diaphragm 3 which is an electronic-parts element, and the parallel arrangement of the electrode pads 18 and 19 is carried out to the end of the aforementioned longitudinal direction. The upper surface is the composition of being caudad located rather than the base of a package, and the electrode pads 18 and 19 are the composition which the crevice was formed in the aforementioned base and the electrode pad upper surface exposed by this. In order to support the crystal diaphragm 3, after making the electrode pads 18 and 19 supply and harden the conductive jointing material S1 and S1, construction arrangement of the shorter side of the crystal diaphragm 3 is carried out at a two-electrodes pad. The conductive jointing material S2 and S2 is applied after that, and a crystal diaphragm and an electrode pad are connected electrically. In addition, by contraction at the time of hardening of conductive jointing material, the other end of the longitudinal direction of a crystal diaphragm lost touch with the aforementioned pars basilaris ossis occipitalis, and has eliminated the bad influence to excitation.

[0021] Another example of other of this invention is explained with drawing 5 taking the case of a surface mount type quartz resonator. Since basic composition is the same as an example besides the above, a part for the same structured division omits explanation in part while explaining it using a jack per line.

[0022] The gestalt of this operation is composition which carries out support-at-one-end \*\*\*\*\* of the end of the longitudinal direction of the crystal diaphragm 3 which is an electronic-parts element, and the parallel arrangement of the electrode pads 41 and 41 is carried out to the end of the aforementioned longitudinal direction. A cross section is a concave, and the electrode pads 41 and 41 are formed so that concave \*\*\*\*\* and the base of a package may be located in the same flat surface. In order to support the crystal diaphragm 3, after making the electrode pads 41 and 41 supply and harden the conductive jointing material S1 and S1, construction arrangement of the shorter side of the crystal diaphragm 3 is carried out at a two-electrodes pad. The conductive jointing material S2 and S2 is applied after that, and a crystal diaphragm and an electrode pad are connected electrically. In addition, by contraction at the time of hardening of conductive jointing material, the other end of the longitudinal direction of a crystal diaphragm lost touch with the aforementioned pars basilaris ossis occipitalis, and has eliminated the bad influence to excitation.

[0023] In addition, the hermetic-seal method should just use the well-known junction methods, such as electron beam welding, laser-beam welding, or seam welding. In addition, when using seam welding, it is necessary to attach a metal ring in the metallized-layer upper part for opening of a package, and to prepare for welding.

## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] The internal cross section by the gestalt of the 1st operation.

[Drawing 2] The plan by the gestalt of the 1st operation.

[Drawing 3] The internal cross section by the gestalt of other operations.

[Drawing 4] The plan by the gestalt of other operations.

[Drawing 5] The interior cross section of a gestalt of operation of another others.

[Drawing 6] Drawing showing the conventional example.

[Drawing 7] Drawing showing the conventional example.

[Drawing 8] Drawing showing the conventional example.

### [Description of Notations]

1 Ceramic Package

10 Ceramic Base

11 Metallized Layer

12 Lower Deposit

13 Up Deposit



14, 15, 18, 19 Electrode pad

2 Metal Free Wheel Plate

3 Crystal Diaphragm (Electronic-Parts Element)





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(71) 出願人 000149734

株式会社大真空

兵庫県加古川市平岡町新在家字鴻野1389番  
地

(72) 発明者 飯塚 実

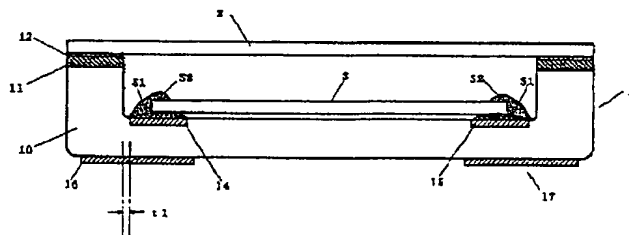
兵庫県加古川市平岡町新在家字鴻野1389番  
地 株式会社大真空内

(54) 【発明の名称】 電子部品用パッケージ

(57) 【要約】

【課題】 小型化しても、気密性を低下させず、信頼性の高い、積層技術を用いた電子部品用パッケージを提供する。

【解決手段】 電子部品用パッケージは、上部が開口した凹形の収納部を有するセラミックパッケージ1と、当該パッケージの中に収納される電子部品素子である水晶振動板3と、パッケージの開口部に接合される金属フタ2とからなる。セラミックパッケージの収納部底面の一部には電極パッド14、15が形成されており、これら電極パッド14、15は、その上面が前記底面と同一平面になるよう配置されているとともに、パッケージ外部の底面に形成された引出電極16、17と電気的に接続されている。



(2)

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## 【特許請求の範囲】

【請求項1】 セラミックス材料を積層形成してなり、凹形の電子部品素子の収納部を有するとともに、前記収納部の底面に前記電子部品素子と電気的接続される電極パッドが複数形成されてなる電子部品用パッケージにおいて、

前記電極パッドの上面は前記収納部の底面と同一平面か、あるいは前記底面より下方に位置するよう形成されており、導電性接合材により前記電極パッドと前記電子部品素子を電気的接合することを特徴とする電子部品用パッケージ。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は電子部品用パッケージに関するものであり、特に気密封止を必要とする電子部品用パッケージに適用されるものである。

【0002】

【従来の技術】気密封止を必要とする電子部品の例として、水晶振動子、水晶フィルタ、水晶発振器等の水晶応用製品があげられる。これらはいずれも水晶振動板の表面に金属薄膜電極を形成し、この金属薄膜電極を外気から保護するため、気密封止されている。

【0003】気密封止方法は、はんだ接合、低融点ガラス接合、抵抗溶接、電子ビーム溶接等がある。抵抗溶接を用いる気密封止方法として、HC-49/U型ベースを用いる水晶振動子が汎用されている。これは、金属シェルにリード端子が絶縁ガラスを介して互いに絶縁した状態で植設されたベースと、金属キャップを抵抗溶接により気密封止する構成であり、水晶振動子等のリード端子を有する電子部品気密封止方法として広く用いられている。

【0004】また、特開平8-162555号に示すように、引出電極の形成されたセラミックパッケージの開口部分に形成された金属枠体（シールリング）と、金属製の蓋体とを抵抗溶接の1種であるシーム溶接により気密封止する表面実装化に対応した接合方法も採用されている。

【0005】さらに、このような表面実装用のパッケージにおいて、特開平8-46075号に示すように、電子ビーム溶接あるいはレーザービーム溶接により気密封止を行う方法も採用されている。

【0006】図6に従来の電子部品用パッケージの一例を示す。上部が開口した凹形のセラミックパッケージ8はセラミック基体80と、凹形周囲の開口部に形成されるタングステン等からなるメタライズ層81と、メタライズ層の上部に形成されるニッケル等からなる下部メッキ層82と、下部メッキ層の上部に形成される金等からなる上部メッキ層83（図示せず）とからなる。セラミックパッケージの内部底面には電極パッド84、85が形成されており、これら電極パッドはパッケージ外部の

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底面に引出電極86、87として電気的に引き出されている。前記電極パッド84、85間には水晶振動板等の電子部品素子88が搭載され、電気的接続されている。電極パッド84、85は断面が凹形であり、導電性接合材の溜まり部分を形成している。

【0007】また、気密封止する金属フタ89はコパール等の金属母材の下面に銀等の金属層（図示せず）を形成している。この金属層は例えば、圧延の手法を用いて形成され、一般にクラッド材と称されている。気密封止を行う場合は、金属フタ89と前記セラミックパッケージ8の上部メッキ層83とを重ね合わせ、金属フタ89の上部から、前記上部メッキ層83に対応する部分に周状に電子ビームを照射して金属フタ89とメッキ層（下部メッキ層および上部メッキ層）を溶融接合する。このような溶接方法はシーム溶接のようにシールリングをパッケージ側に必要としないので、製造工数の削減、並びにパッケージのコストを下げるという利点を有していた。

【0008】上記セラミックパッケージは、例えば図8に示すような順で積層を行う。図8（a）に示すように、ドクターブレード法等によって形成されたグリーンシートを所定の寸法に切断し、基体グリーンシート90を得る。次に図8（b）に示すように、電極パッド用のメタライズ層91、92をスクリーン印刷法等によって形成する。なお、必要に応じて電極引出用のピアホール等を形成する。そして図8（c）に示すように、基体グリーンシート90の周囲近傍に枠状グリーンシート93を形成し、さらに図8（d）に示すように、枠状グリーンシート93の上面に気密封止用のメタライズ層94をスクリーン印刷法等によって形成する。その後、これら一体物を焼成成形してセラミックパッケージを得る。

【0009】

【発明が解決しようとする課題】電子部品の小型化に伴って、パッケージも小型化され、微細な寸法設計が必要になる。しかしながらセラミックスの積層精度を微細に制御することは難しく、バラツキを許容する設計が必要となる。例えば、図6に示すように、電極パッド84とパッケージ基体の内壁80aとの間隔 $t_2$ を、例えば $12\mu\text{m}$ 以上に設定する必要がある。従来例のような構成において、パッケージの小型化を目指して当該間隔 $t_2$ を小さくした場合、そのバラツキにより、図7に示すように電極パッドとパッケージ基体の内壁部分が重なって積層されてしまうことがあった。なお、図7は図6の一部拡大図である。このような場合、メタライズ層81が傾斜してまい、金属フタとの接合に不具合を生じさせ、十分な気密性の得られなくなったり、気密面での信頼性に欠ける構造になる問題点を有していた。特に、本従来例に示すように、電極パッドが断面凹形である構成においては、凹形の堤部分により、メタライズ層がより傾斜してしまうことがあった。

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【0010】本発明は上記問題点を解決するためになされたもので、小型化しても、気密性を低下させず、信頼性の高い、積層技術を用いた電子部品用パッケージを提供することを目的とするものである。

【0011】

【課題を解決するための手段】本発明は、請求項1に示すように、セラミックス材料を積層形成してなり、凹形の電子部品素子の収納部を有するとともに、前記収納部の底面に前記電子部品素子と電氣的接続される電極パッドが複数形成されてなる電子部品用パッケージにおいて、前記電極パッドの上面は前記収納部の底面と同一平面か、あるいは前記底面より下方に位置するよう形成されており、導電性接合材により前記電極パッドと前記電子部品素子を電氣的接合することを特徴とするものである。

【0012】前記電極パッドの上面は前記収納部の底面と同一平面か、あるいは前記底面より下方に位置するよう形成されているので、セラミックスの積層位置がずれて、電極パッド部分と一部重なることがあっても、メタライズ層が大きく傾くことはない。なお、電極パッドが収納部底面より下方に位置するよう形成された構成においては、電極パッドの上面の位置が深すぎると積層位置がずれた場合、メタライズ層の傾きが大きくなるので注意が必要である。

【0013】また、前記電極パッドの上面が前記収納部の底面より下方に位置する構成においては、凹部が形成された構成となるので、当該電極パッドに供給された導電性接合材が流出しにくくなる。従って、後述の他の実施の形態で説明したような、電極パッドが互いに近接する構成であっても、短絡事故を防止できる。このような凹部が形成された構成においては、導電性接合材の貯留機能を確保するためある程度の深さを必要とするので、前記収納部の底面から前記電極パッドの上面間での深さは、好ましくは $15 \pm 10 \mu\text{m}$ である。

【0014】

【発明の実施の形態】本発明の実施の形態を表面実装型の水晶振動子を例にとり図1、図2とともに説明する。電子部品用パッケージは、上部が開口した凹形の収納部を有するセラミックパッケージ1と、当該パッケージの中に収納される電子部品素子である水晶振動板3と、パッケージの開口部に接合される金属フタ2とからなる。

【0015】凹形の収納部を有するセラミックパッケージ1は、セラミック基体10と、凹形周囲の開口部に形成されるタングステン等からなるメタライズ層11と、メタライズ層の上部に形成されるニッケル等からなる下部メッキ層12と、下部メッキ層の上部に形成される金等からなる上部メッキ層（図示せず）とからなる。メッキ層は主に溶接に寄与する領域である。メタライズ層は焼成前にメタライズ層上部からパンチでプレス加工する。これにより焼成後のメタライズ層の上面は、平坦化

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されるとともに、メタライズ層全体がセラミック基体に一部埋設され、両者の接合強度が向上する。

【0016】各層の厚さは、この実施の形態では、メタライズ層11が $18 \sim 20 \mu\text{m}$ 、下部メッキ12が $6 \mu\text{m}$ 、上部メッキ層13が $1 \mu\text{m}$ である。なお、メタライズ層の厚さは $15 \sim 35 \mu\text{m}$ 程度あればよいが、プレス処理が行われる場合は当該上面の平坦度が向上するので、それ以下の厚さであってもよい。なお、メタライズ層が平坦化されることにより、その上部に形成される各メッキ層もその上面は平坦な状態を維持して形成される。

【0017】また、セラミックパッケージの収納部底面の一部には電極パッド14、15が形成されており、これら電極パッド14、15は、その上面が前記底面と同一平面になるよう配置されているとともに、パッケージ外部の底面に形成された引出電極16、17と電氣的に接続されている。前記電極パッド14、15間には電子部品素子3である水晶振動板が設置されている。なお、これら電極パッド14、15は収納部の内壁との距離も1は $5 \mu\text{m}$ 程度に設定している。

【0018】また、気密封止する金属フタ2はコパール等の金属母材20の下面に銀等からなる金属層（図示せず）を形成している。この金属層の形成は例えば、圧延の手法を用いて形成されている。気密封止を行う場合は、金属フタ2と前記セラミックパッケージ1のメッキ層（下部メッキ層と上部メッキ層）とを重ね合わせ、金属フタ2の上部から、前記上部メッキ層13に対応する部分に周状に電子ビームを照射することにより、金属フタ2と、メッキ層（下部メッキと上部メッキ層）が溶融し接合される。

【0019】本発明の他の実施例を表面実装型の水晶振動子を例にとり図3、図4とともに説明する。基本構成は上記実施例と同じであるので、同じ構造部分は同番号を用いて説明するとともに、一部説明を割愛する。

【0020】本実施の形態は、電子部品素子である水晶振動板3の長手方向の一端を片持ち支持する構成であり、前記長手方向の一端に電極パッド18、19が並列配置されている。電極パッド18、19はその上面がパッケージの底面よりも下方に位置する構成であり、前記底面に凹部が形成され、これにより電極パッド上面が露出した構成である。水晶振動板3を支持するには、電極パッド18、19に導電性接合材S1、S1を供給し、硬化させた後、水晶振動板3の短辺を両電極パッドに架設配置する。その後導電性接合材S2、S2を塗布し、水晶振動板と電極パッドとを電氣的に接続する。なお、導電性接合材の硬化時の収縮により、水晶振動板の長手方向の他端は前記底部から浮き上がり、励振への悪影響を排除している。

【0021】本発明のもう一つの他の実施例を表面実装型の水晶振動子を例にとり図5とともに説明する。基本

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構成は上記他の実施例と同じであるので、同じ構造部分  
は同番号を用いて説明するとともに、一部説明を割愛す  
る。

【0022】本実施の形態は、電子部品素子である水晶  
振動板3の長手方向の一端を片持ち支持する構成であ  
り、前記長手方向の一端に電極パッド41、41が並列  
配置されている。電極パッド41、41は断面が凹形で  
あり、凹形の堤部分とパッケージの底面とが同一平面に  
位置するよう形成されている。水晶振動板3を支持する  
には、電極パッド41、41に導電性接合材S1、S1  
を供給し、硬化させた後、水晶振動板3の短辺を両電極  
パッドに架設配置する。その後導電性接合材S2、S2  
を塗布し、水晶振動板と電極パッドとを電氣的に接続す  
る。なお、導電性接合材の硬化時の収縮により、水晶振  
動板の長手方向の他端は前記底部から浮き上がり、励振  
への悪影響を排除している。

【0023】なお、気密封止方法は電子ビーム溶接、レ  
ーザービーム溶接、あるいはシーム溶接等の公知の接合  
方法を用いればよい。なお、シーム溶接を用いる場合  
は、パッケージの開口部分のメタライズ層上部に金属リ  
ングを取り付け、溶接に備える必要がある。

【0024】

【発明の効果】本発明によれば、前記電極パッドの上面  
は前記収納部の底面と同一平面か、あるいは前記底面よ  
り下方に位置するよう形成されているので、セラミック  
スの積層位置がずれて、電極パッド部分と一部重なるこ  
とがあっても、メタライズ層が大きく傾くことはない。  
従って、金属フタとの気密接合が良好で、気密面での製

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造歩留まりを向上させることができる。

【0025】また、セラミックの積層の製造誤差を許容  
する構成であるので、全体としてパッケージの小型化を  
実現できる。

【0026】また、前記電極パッドの上面が前記収納部  
の底面より下方に位置する構成においては、凹部が形成  
された構成となるので、当該電極パッドに供給された導  
電性接合材が流出しにくくなる。従って、後述の他の実  
施の形態で説明したような、電極パッドが互いに近接す  
る構成であっても、短絡事故を防止できる。

【図面の簡単な説明】

【図1】第1の実施の形態による内部断面図。

【図2】第1の実施の形態による平面図。

【図3】他の実施の形態による内部断面図。

【図4】他の実施の形態による平面図。

【図5】もう一つの他の実施の形態内部断面図。

【図6】従来例を示す図。

【図7】従来例を示す図。

【図8】従来例を示す図。

【符号の説明】

1 セラミックパッケージ

10 セラミック基体

11 メタライズ層

12 下部メッキ層

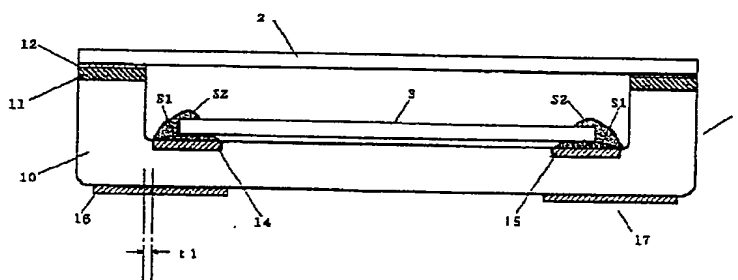
13 上部メッキ層

14, 15, 18, 19 電極パッド

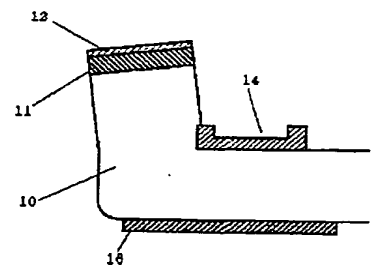
2 金属フタ

3 水晶振動板（電子部品素子）

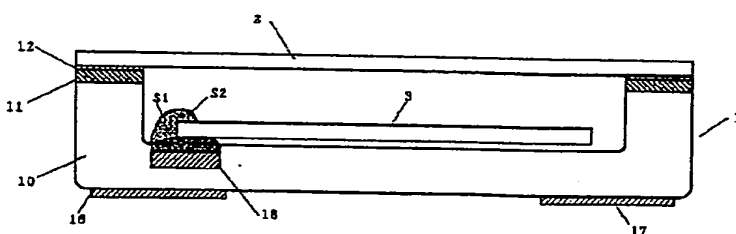
【図1】



【図7】

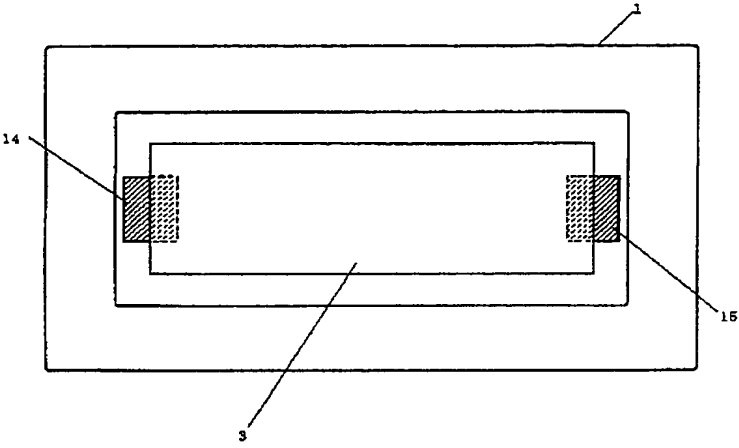


【図3】

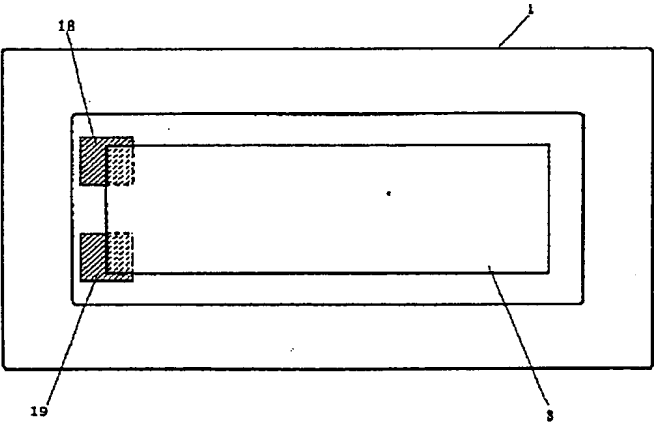


(5)

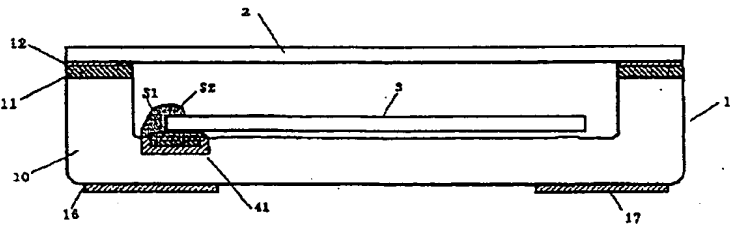
【図2】



【図4】

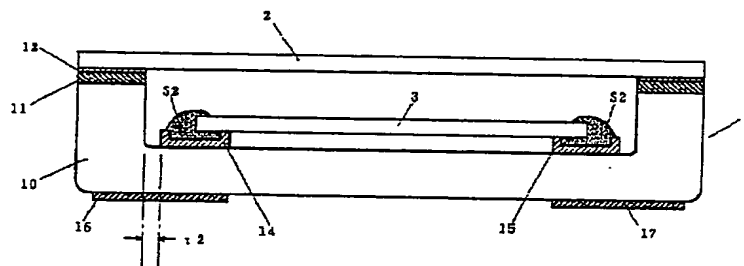


【図5】



(6)

【図6】

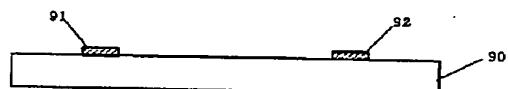


【図8】

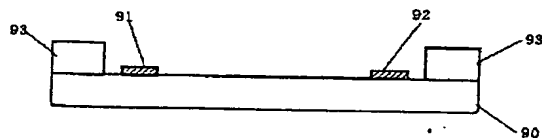
(a)



(b)



(c)



(d)

